

REMARKS/ARGUMENTS

Claims 1, 3-20, 24-29 are pending in the application along with new claims 30-32. Reconsideration and a withdrawal of the outstanding rejections is requested in view of the above amendments and the following remarks.

AMENDMENTS TO CLAIM 1

Claim 1 has been amended to recite a preferred embodiment of the invention wherein the concentration is from 0.005 to 0.5 mg/l. No new matter has been introduced and the amendment is fully supported by the specification (see p. 5, lines 24-27, or the published specification at par. [0022]). Accordingly, the Applicant addresses below the rejections involving this claim, as amended. The other rejections are believed to be moot in view of the amendment.

Accordingly, the pending claims should be patentable over the cited art.

THE CLAIM OBJECTIONS

Applicant is pleased that the claim objections have been withdrawn.

THE SECTION 112 REJECTION

Applicant is pleased that the section 112 rejection has been withdrawn.

THE SECTION 102/103 REJECTION OVER COBLEY ET AL. (Solution)

Claims 1-3, 8-16, 19-20 and 28 stand rejected under 35 USC 102(e) as being anticipated by, or in the alternative, under 35 USC 103(a) as being obvious over Cobley et al. That rejection appears to be moot in view of the amendment, as the rejection under 102(e) with respect to claim 2 has been withdrawn. The claim 2 concentration now appears in claim 1. This rejection is respectfully but strenuously traversed and reconsideration and a withdrawal of the rejection are hereby requested.

The claimed matter has been separately rejected under Gabe et al., and accordingly, Applicant also addresses that rejection in the comments below.

Applicant has amended claim 1 to more particularly recite the concentration range of the aromatic halogen derivative having the formula (I) from 0.005 to 0.5 mg/l.

Applicant's invention is not disclosed or taught by the cited references. Both Cobley et al. and Gabe et al. teach a plating bath composition containing aldehydes or alcohols, respectively, to inhibit consumption of additives added to metal plating baths in order to improve metal deposition on a substrate, at a concentration of from about 0.001 g/l to about 100 g/l of bath (1 mg/l to 100000 mg/l), wherein each reference specifically teaches a concentration of from 0.1 g/l to 10 g/l (see Cobley et al. at col. 9, line 49, for example). Therefore, the upper limit of the concentration range of the Applicant's invention, as recited in claim 1, and the lower limit of the concentration ranges taught by

Cobley et al. or Gabe et al. differ by 0.5 mg/l. For comparative purposes, the references are a two-fold increase over the present invention, or a 100% increase.

Although the Examiner has referred to this concentration at pages 14 and 16 of the Office Action, claim 1 now recites the concentration of 0.005 mg/l to 0.5 mg/l and therefore does not provide the tolerance that would lead one to the claimed range of the Cobley et al. reference. So for this reason, claim 1 is distinguishable over and is not taught or suggested by Cobley et al. Similarly, the claimed invention is distinguishable over Gabe et al.

In addition, the Applicant points out that this difference accounts for a ratio of a lower limit of the concentration range of Cobley et al. (which is 0.001 g/L) to the upper limit of the concentration range of the present invention (which is 0.5m g/L) to be 2, i.e., the lower concentration limit of the prior art is twice as large as the upper concentration limit of the present invention. If the narrower concentration range of Cobley et al. is considered, for example, the 0.1 g/L to 10 g/L, then the ratio between the respective two limits is even very much larger (i.e., 200 times larger or 20000%).

Accordingly, the concentration used according to the present invention is much lower than the concentration taught to be used in Cobley et al. (or even Gabe et al. – see below). It is for this reason that the solution as claimed is not anticipated by either Cobley et al. or Gabe et al. (as discussed below).

As Applicant previously pointed out, the elevated concentrations taught and disclosed by the cited references relied on would not provide the results of the present

invention. For example, turning to the Applicant's comparative examples provided in the specification, one reveals that:

The Example of the Invention 1b provided in the present application (WO 2005/014891 A2: page 16, lines 7-16) shows the quality of a copper surface obtained with a plating bath which contained an aromatic halogen derivative (4-chloro-3,5-dimethylphenol) of general formula 1 of the present invention at a concentration of 0.1 mg/l (or 0.0001 g/L). The coatings produced were mirror-polish and well leveled. They did not show any voids. This example is one tenth the Cobley et al. lower limit of the Cobley et al. range.

The Comparative Example 1c shown in the present application (WO 2005/014891 A2: page 16, lines 18-23) shows the quality of a copper surface obtained with a plating bath which contained an aromatic halogen derivative (same compound as before: 4-chloro-3,5-dimethylphenol) at a concentration of 76 mg/l. The coatings were not bright but rather had a mist-type appearance being comprised of a plurality of pittings and nodules. This comparative example here would be within the Cobley et al. range (e.g., 76 mg/L or 0.076 g/L) and does not demonstrate the results of the present invention.

The further Comparative Example 1d shown in the present application (WO 2005/014891 A2: page 16, lines 25-29) shows the quality of a copper surface obtained with a plating bath which contained an aromatic halogen derivative (same compound as before: 4-chloro-3,5-dimethylphenol) at a concentration of 152 mg/l. The coating produced was matte and could therefore

not be used as a decorative coating. Again this higher concentration of 152 mg/L or 0.152 g/L which is within the Cobley et al. ranges, the result of the present invention is not achieved.

As Applicant previously pointed out, the above experiments show that the concentration of the additives used is very sensitive to the quality of the coating obtained. If the concentration is large, the quality is such that the coatings obtained are not satisfactory for decorative purposes, whereas, with low level application of the additives, excellent results are achieved.

Accordingly, the claimed concentration of the present invention, as recited in claim 1, provides for a concentration range that is substantially lower than what the prior art teaches, and provides results that the prior art ranges do not achieve.

Applicant also previously discussed the reasons why the concentrations in the cited references are large and therefore, why one of ordinary skill would not have been led to make the modifications that would be necessary to arrive at the present invention. Cobley et al. use aldehyde compounds and Gabe et al. use alcohols, *to inhibit or retard or prevent or reduce the consumption degradation of plating bath additives*, which is due to oxidation of the additives (for example, Cobley et al.: col. 10, lines 1-6). Therefore, one of ordinary skill in the art would not take from the references to reduce concentrations (e.g., to the level of Applicant's concentrations) since the concentration of the compounds to inhibit the degradation of the other additives must be present in a much larger amount than the latter additives because they are consumed while inhibiting, retarding, preventing or reducing consumption/degradation of the plating bath additives.

Contrary to this, the aromatic halogen derivatives of the present invention are *active agents which directly interact with the plating process and whose purpose is not to reduce or prevent degradation of the bath additives*. Therefore, the compounds are not required to be present in the plating solution in a large amount, and for this reason, the effectiveness of the low concentration levels claimed by Applicant provide results that the concentrations of the cited art, if applied as the office action proposes to do, would not (see the comparative examples above).

This distinction is further particularized by reference to the cited art. Both Cobley et al. and Gabe et al. instruct one of ordinary skill in the art to use a concentration of their additive preserving compounds which is rather larger than the lower limit set forth in each of these references, and is *not lower than the lower limit*. Accordingly, Cobley et al. and Gabe et al. actually teach away from the present invention, as Cobley teaches that:

the additive consumption inhibiting compounds of the present invention are believed to inhibit the consumption of additives by one or a combination of the following mechanisms. Many additives break down or decompose at the anode to oxidation products. The aldehydes may competitively adsorb onto an anode over the additives, and become oxidized in place of the additives. Many metal plating baths contain chloride. Chloride is often added to metal plating baths in the form of HCL. Chloride is oxidized at the anode to chlorine. Chlorine may then oxidize the bath additives reducing the effectiveness of the additives in the metal plating bath. By adding one or more of the aldehydes of the present invention to the metal plating bath, chlorine oxidizes the one or more aldehydes over the additives. In other words, the aldehydes perform as sacrificial species. In another mechanism, the additive consumption inhibiting aldehydes may compete with chloride, or with both chloride and the additives at the surface of the anode. Thus, the aldehydes are oxidized at the anode over the chloride, or both the chloride and the additives.
(Cobley et al. at col. 7, lines 9-38)

The same explanation is provided in Gabe et al. with respect to the alcohols disclosed therein:

alcohols of the present invention are believed to inhibit additive consumption by one or a combination of the following mechanisms. Many additives break down or decompose at the anode to oxidation products. The alcohols of the present invention may competitively adsorb onto an anode over additives, and become oxidized in place of the additives. Many metal plating baths contain chloride. Chloride is often added to metal plating baths in the form of HCl. Chloride is oxidized at the anode to chlorine. Chlorine may then oxidize the bath additives reducing the effectiveness of the additives in the metal plating bath. By adding one or more alcohols to the metal plating bath, chlorine oxidizes the one or more alcohols over the additives. In other words, the alcohols may perform as sacrificial species. In another proposed mechanism, the alcohols may compete with chloride, or with both chloride and the additives at the anode surface. Thus, the alcohols are oxidized at the anode over the chloride, or both the chloride and the additives.

(Gabe et al., at col. 8, line 57 – col. 9, line 8)

Accordingly, the applicable legal precedent supports the Applicant's position against the obviousness of the present invention here, because the cited references fails to teach the present invention, and actually teach away from what one of ordinary skill in the art would be taught given the disclosure of those references.

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be led in a direction divergent from the path that was taken by the applicant.

In re: Gurley, 27 F.3d 551, 31 U.S.P.Q. 2d 1130 (Fed. Cir. 2006).

Here, the disclosure of the prior art would not have been looked to by one of ordinary skill in the art for a teaching of the present invention, where concentrations lower than the lower limit of the concentration range in the cited references are used. Where a reference teaches away from the invention that is sufficient to defeat an

obviousness claim. (*See Winter Int'l Royalty Corp. v. Ching-Rong Wang*, 202 F.3d 1340, 53 U.S.P.Q. 2d 1580 (Fed. Cir. 2000)).

CLAIM 29 AND THE 112 REJECTION

Claim 29 stands rejected under 35 U.S.C. 112 as failing to comply with the written description requirement. This rejection is respectfully traversed.

As to the section 112 rejection, applicant points out that the Office Action had considered the invention to encompass the compounds for which the 112 rejection is applied by virtue of the Office Action citation to the Cobley et al. reference and application of that reference as a basis of rejection contending that Applicant's invention encompassed the Cobley et al. compounds. Accordingly, the present invention recited in claim 29 is supported by the present specification. See *Tex. Instruments, Inc. v. Int'l Trade Comm'n*, 805 F.2d 1558, 1563 (Fed. Cir. 1986) ("This court has cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.")

Furthermore, new claim 30 has been presented to more particularly articulate the subject matter relating to claim 29, but in a different manner. New claim 30 depends from claim 1 and recites that the formula (I) in claim 1 is not any one of 2-chloro-4-hydroxybenzaldehyde, 4-chlororesorcinol and 3-chlorophenol. To the extent that the Applicant's present invention includes other compounds that, within the concentration range of claim 1, are not specifically disclosed by the cited references, Applicant claims those compounds. The excluded compounds are the only additive consumption inhibiting

compounds that are explicitly recited in the references that have halogen substitution at the phenyl moiety.

Claims 31 and 32 have been presented also to include the feature where the aromatic halogen derivative formula (I) in claim 1 is not any one of 2-chloro-4-hydroxybenzaldehyde, 4-chlororesorcinol and 3-chlorophenol. Claim 31 differs from claim 30 in that the concentration is recited to be less than 1.0 mg/L, and claim 32 recites the concentration from 0.005 mg/l to 0.9 mg/l. Both the specific compounds and the claimed concentrations are not disclosed or suggested by the cited references for the reasons set forth herein. Accordingly, Applicant submits that new claims 31 and 32 should be patentable over Cobley et al. and Gabe et al.

Accordingly, claims 31 and 32 should be patentable over the cited references.

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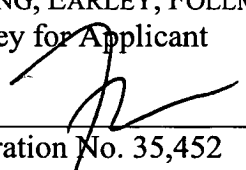
In the event that issues remain, the Examiner is invited to telephone the Applicant's undersigned representative to resolve them.

If necessary, an appropriate extension of time to respond is respectfully requested.
This reference is referred to in the Office Action.

The Commissioner is authorized to charge any additional fees which may be required to Patent Office Deposit Account No. 05-0208.

Early action on the case and examination of the pending claims is hereby earnestly solicited.

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